the wind of its force. It is anticipated that the long lines of plantation bordering parts of the Suez Canal will check the drift of the sand from the west, causing it to pile up in a rampart parallel to the canal. The trees should live and grow even when nearly buried in sand, being nourished by the water at their roots.

The largest of the dunes described by the author are those bordering the old Pelusiac branch of the Nile, eastward of the Suez Canal. The height of these dunes is reckoned at 300 feet and upwards. Once enveloped within the labyrinth of sandhills, however, the dimensions appear to be much greater. Under a low sun the scenery is especially remarkable. The startling contrast of light and shadow, the absence of detail on the smooth surfaces of pure blown sand, the steep slopes and bold forms, together with great clearness of definition and a death-like stillness, combine to produce a mountainous impression. It requires an effort of reason to correct the illusion of being surrounded by mountains of three thousand metres rather than by hills of three hundred feet.

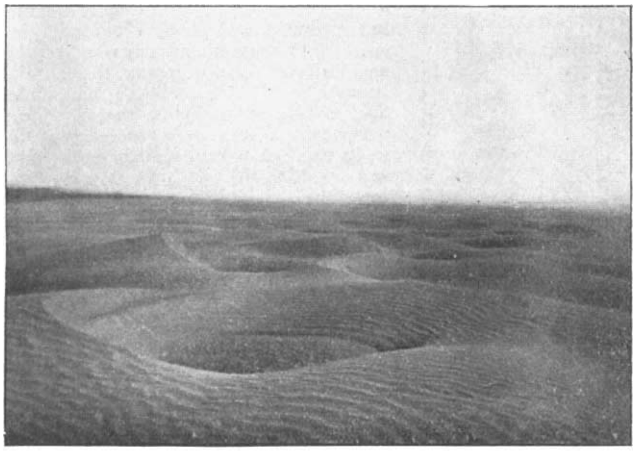

FIG. 3.—A Fulj.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Mr. Frederic Harrison has been appointed Rede Lecturer for the present academical year.

The Chancellor has given official interpretations of certain statutes, respecting which doubts had been raised by the Council of the Senate. It appears that a Deputy Professor is declared competent and bound to perform all the functions of the Professor, and that it is not possible for the latter to reserve or to resume any of his duties during the term for which the Deputy is appointed. It also appears that the statutes give the University no power to forbid Readers or Professors from taking private pupils.

The grace for limiting the scope of Part I. of the Mathematical Tripos was rejected by 151 votes to 130; and that for abolishing the order of merit, and with it the Senior Wranglership, was rejected by 161 votes to 129. A considerable number of non-resident members of the Senate attended to register their votes. The other readjustments proposed by the Mathematical Board, chiefly affecting Part II. of the Tripos, were carried without a division.

WE learn from *Science* that the Regents of the University of California have adopted the policy of giving the professors of the University one year's leave of absence in seven. The Sabbatical year is widely recognised by American universities, and the opportunity it affords the professors of visiting distant countries and fellow-workers is invaluable. The custom could be introduced with advantage in our own universities and colleges.

THE London *Technical Education Gazette* announces that botanical gardens have been laid out in Battersea, Ravenscourt and Victoria parks. Good collections of plants, representing various natural orders, have been obtained, and the more important trees and shrubs in the parks have been labelled. These gardens have been specially provided for the use of teachers and students of botany. Teachers who desire to obtain tickets should apply to the secretary of the Board, 116, St. Martin's-lane, W.C., giving their names in full and the name of the school where they are teaching.

AT the distribution of the prizes and certificates gained by the students in connection with the City and Guilds of London Institute, on Thursday last, Sir Douglas Fox, addressing the students, said that to specialise in study too early was a great mistake. The great point was to lay the foundation as wide and as broad as possible. That done, the next thing was to properly apply what had been learned. Mr. Watney afterwards made a statement as to the results obtained during the past year, and mentioned that in one way or another the Clothworkers' Company had subscribed 85,000*l.* towards the maintenance of the institute. At the invitation of the Royal Commissioners appointed by Parliament to reorganise the University of London, the executive committee have recently accepted the position of a "school of the University" for its Central Technical College.

THE results of an inquiry into the development of technical education in connection with English Secondary Schools during the past decade, made by the National Association for the Promotion of Technical and Secondary Education, are given in the current number of the *Record*. It appears from the report that in England alone, since 1889, 81 new public secondary schools have been established, while 215 existing schools have been extended mainly for the purposes of science teaching. As regards the schools in the latter category, the extensions to 195 of them have resulted in the addition of 251 physical and chemical laboratories, 77 workshops for manual training, 76 lecture-rooms, and 50 class-rooms. The total sum of money involved by these developments is 764,449*l.* Of this sum, local authorities have voted an amount of 147,496*l.*, the rating and borrowing powers of the Technical Instruction Acts being utilised to raise 20,707*l.* and the Residue Grant supplying the remainder. Taking *technical* and *secondary* schools together, as many as 664 schools have been affected by the efforts of County and County Borough Councils and other municipal authorities and of responsible public committees. Of this number of *technical* and *secondary* schools, 385 have been or are being established, while there are 279 existing schools which have been or are being extended or adapted. The capital expenditure incurred for these purposes *now* reaches in the aggregate 3,302,221*l.*, of which a sum of 1,896,110*l.*, or 57½ per cent., has been or is being supplied by local authorities from Imperial Funds or from local rates.

SCIENTIFIC SERIALS.

Bulletin of the American Mathematical Society (December 1, 1899–January 2, 1900).—(1) The proceedings of the October meeting in New York City are summarised, and abstracts of some of the twelve papers read are given by Prof. F. N. Cole.—Note on the simply transitive primitive groups, by Dr. G. A. Miller, contains some theorems and corollaries which are closely connected with a paper by the author in the *Proceedings* of the London Mathematical Society (vol. xxviii. pp. 533–544). The same writer contributes a short note on the commutators of a given group. Two theorems given are, every substitution of the alternating group of degree n ($n > 4$) is a commutator of two substitutions of the same group. "If the order of a cyclical group is odd, it is the commutator sub-group of its holomorph, and all its operators are commutators of this holomorph. When this order is even, the commutator sub-group of the holomorph includes half of the operators of this cyclical group, and all these operators are commutators of this holomorph." These results are partly supplementary to those contained in Dr. Miller's paper on the commutator groups (*Bulletin*, vol. iv.).—Dr. Lovett gives an account of Oltramare's Calcul de généralisation. From it we learn that this is the magnum opus of the writer, who is probably

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the oldest living pupil of Cauchy. It sums up the work done by the Professor during the last twenty years. Several short notices, notes and new publications complete the number.

(2) The number opens with the President's (Prof. R. S. Woodward) address, delivered before the Society at its sixth annual meeting, December 28, 1899. It is entitled "The Century's Progress in Applied Mathematics." We learn from the "Notes" that the address has been printed in a separate pamphlet (25 cents each).—The status of imaginaries in pure geometry, by Prof. Charlotte Scott, is a paper which was communicated at the October meeting. Her text is the works of Von Staudt and Reye. She remarks that "it is one of the axioms of modern mathematics that Von Staudt placed the doctrine of imaginaries on a firm geometrical basis; but logical and convincing as his treatment is, when patiently studied in all its detail, it yet seems to me hardly practicable as a class-room method"; and then she proceeds concisely to examine the writings of the two above-named mathematicians, so far as they treat of imaginaries in pure geometry. The usual matter follows.

Bollettino della Società Sismologica Italiana, vol. v. 1899-1900, Nos. 4, 5.—On the present state of Vesuvius (July 3, 1899) and on the endogenous rising of the new lavic cupola during the months of February and March, 1898, by R. V. Matteucci.—The central explosion of Etna on July 19, 1899, by S. Arcidiacono.—On the activity of the volcanoes Vesuvius, Etna, Vulcano, Stromboli and Santorin in the autumn of 1898, by R. V. Matteucci.—The crater of Etna after the explosions of July 19 and 25, 1899, by A. Mascari. The effects of the explosions on the terminal cone and the internal condition of the crater are described.—New type of seismoscopic clock, by G. Agamennone.—Summary of the seismography of the earthquake of November 16, 1894, in Calabria and Sicily, by A. Riccò. A reprint of a memoir already noticed in NATURE.—Notices of earthquakes recorded in Italy (April 23-July 21, 1898), by G. Agamennone and A. Cancani, the most important being the earthquakes of Tripolitza (Greece) on June 2-3, Rieti on June 28, and Dalmatia on July 2, and earthquakes of distant origin on April 29, May 8 and June 22 and 29.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 18.—"Further Observations on 'Nitragin' and on the Nature and Functions of the Nodules of Leguminous Plants." By Maria Dawson, B.Sc. (Lond. and Wales), 1851 Exhibition Science Research Scholar. Communicated by Prof. H. Marshall Ward, F.R.S.

In the continuation of the author's work (see *Phil. Trans.* vol. 192, p. 1, 1899) in the Cambridge Botanical Laboratory, cases have been observed—*e.g. Phaseolus, Desmodium, Acacia*—in which the filaments containing the organism disappear from the nodules at a very early age: no sharp distinction can be drawn between these and the nodules of *Pisum, Lupinus*, &c., where the filaments abound in much older nodules, but the suggestion arises that the mode of growth depends on special adaptations of the organism to the conditions in the cells of the nodules in each host. A marked crystal-layer occurs in the nodules of some genera; in others—*e.g. Desmodium, Robinia*—peculiar apple-green, nucleus-like cell contents are found. The organisms are unusually large in *Desmodium, Coronilla, Psoralea*, and some others; and single rods, isolated from pure cultures, of those from *Desmodium* were observed continuously under high powers in hanging drops, and their growth traced. *The X and Y-shaped bacteroids arise by distinctly lateral branching of the straight rods.* After twelve to fourteen days these break up into shorter rodlets. Pure cultures were made on various media, and the organism was successfully grown on silica jelly with nutrient salts. In seven days, at 17° C., colonies of the *Desmodium* organism were as much as 30 μ in diameter. The author is employing this method for testing the power of the organism to fix nitrogen.

Comparisons of "nitragin" with pure cultures from *Pisum* and *Desmodium* show that all grow readily on gelatine or agar with additions of extract of pea-stems, asparagin and sugar; less readily on potato. Milk is not peptonised. A thick zooglœa forms on a decoction of peas. The organism is aërobic, does not ferment sugars, and may pass through a short motile stage. Other bacteriological characters are also examined, including the influence of temperature on infection of the root-hairs of the pea.

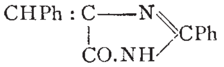
The author's experiments with reciprocal infections of organisms from one genus of Leguminosæ to another, point to there being but one species concerned, but this is probably split up into several culture-races, specialised to the various agricultural and other plants concerned, as in the case of the rust-fungi, yeasts, &c.

Crop-cultures of peas infected with the organism, in sterilised soil, ordinary soil, sand, sub-soils, &c., gave contradictory results. In a few cases a small increase was got by the use of the organism alone; but in other cases where nitrates were used instead the crop was larger. When nitrates as well as "nitragin" are added the crop may be even reduced.

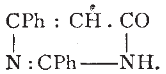
The conclusion derived from the various experiments, however, is that the presence or absence of "nitragin" is but one factor in a complex problem, and that at the same time must be taken into account the complicated physical and biological conditions of the soil and atmospheric environments, as well as the symbiotic action of the host plants, in the removal of the products of metabolism from the field of action of the nodule organisms.

Chemical Society, February 1.—Prof. Thorpe, President, in the chair.—The following papers were read.—The chlorine derivatives of pyridine. Part v. Constitution of citrazinic acid. Formation of $\alpha\alpha'$-dichloropyridine and of $\alpha\alpha'$-diiodoisonicotinic acid, by W. J. Sell and F. W. Dootson.—The formation of heterocyclic compounds, by S. Ruhemann and H. E. Stapleton. Benzamidine and ethyl phenylpropiolate react with formation of an intermediate product, $NH\left\langle\begin{array}{l}CO.C:CPh\\ CPh:NH\end{array}\right.$, which then condenses, yielding

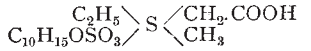
benzalphenylglyoxalidone,



and diphenylpyrimidone,

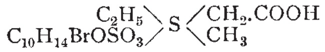


Urea, thiourea and guanidine condense with ethyl phenylpropiolate yielding substituted hydantoins.—The space configuration of quadrivalent sulphur derivatives. Methylethylthetine dextrocamphorsulphonate and dextro-α-bromocamphorsulphonate, by W. J. Pope and S. J. Peachey. The authors have prepared thetine salts of the constitutions



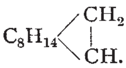
$$\begin{array}{r}C_2H_5\\ C_{10}H_{15}OSO_3\end{array}\Big\rangle S \Big\langle\begin{array}{l}CH_2.COOH\\ CH_3\end{array}$$

and

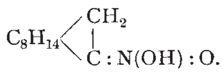


$$\begin{array}{r}C_2H_5\\ C_{10}H_{14}BrOSO_3\end{array}\Big\rangle S \Big\langle\begin{array}{l}CH_2.COOH\\ CH_3\end{array}$$

containing optically active acid radicles, and show that the basic thetine radicle is not optically active. They conclude that in a thetine the sulphur atom and the four atoms directly attached to it lie in one plane.—Nitrocamphane, by M. O. Forster. The author has prepared nitrocamphane and pseudonitrocamphane, to which he assigns the constitutions



and



Nitrocamphane is prepared by reducing bromonitrocamphane, and yields pseudonitrocamphane when its potash solution is acidified.—The absorption spectra of ammonia, &c., by W. N. Hartley and J. J. Dobbie.—Isoamarine, by F. R. Japp and J. Moir. The isoamarine of Feist and Arnstein obtained by heating *s*-dibenzoyl-*r*-diphenylethylenediamine in hydrogen chloride gas is identical with Snape and Brooke's isoamarine.—On the condensation of formaldehyde with ethyl malonate and on the synthesis of pentamethylenetricarboxylic acid, by J. F. Bottomley and W. H. Perkin, junr. In addition to the substances previously described as resulting from the condensation of formaldehyde with ethyl malonate, it is shown that ethyl pentanehexacarboxylate,

$$(CO_2Et)_2CH.CH_2.C(CO_2Et)_2.CH_2.CH(CO_2Et)_2,$$

may also be formed. It is hydrolysed by baryta, yielding propanetetracarboxylic acid, $(CO_2H)_2CH.CH_2.CH(CO_2H)_2$, and by hydrochloric acid with formation of the corresponding acid, which on heating to 200° gives pentanetricarboxylic acid, $CO_2H.CH_2.CH_2.CH(CO_2H).CH_2.CH_2.CO_2H$. — The volumetric estimation of potassium, by R. H. Adie and T. B. Wood. The authors precipitate potassium as its cobaltinitrite,

$$K_6Co_2(NO_2)_{12},3H_2O,$$

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